Technology Innovation Project

Project Brief

TIP 332: Open Source Platform for Accelerating Synchrophasor Analysis

Context

Continuing increases in the volume of data generated from Phasor Measurement Units (PMUs) has resulted in a data overload challenge. Currently the BPA synchrophasor lab manages a 40 Terabyte (TB) historical data archive and frequently needs to reparse datasets for internal and external researchers. Every month an additional 3 TB is added. New queries are time consuming for staff and processor intensive even when queries are similar to previous queries.

Description

This project develops methods of data mining information from archived data to improve operational performance, demonstrating quantifiable cost savings for users.

PNNL implemented a limited prototype data mining system on a HPC Linux cluster showed the feasibility of this approach. This is the starting point our project builds upon.

The multiyear project will extend the work of PNNL in two directions. First, it implements a parallel layer that is usable on clusters but also scale down to a loosely coupled group of standard Windows workstations. Second, it works with engineering and operations to identify the most important data for query and analysis and develop techniques for accelerating these common tasks.

Portland State University's team brings members from three different departments: Computer Science, Electrical Engineering, and Engineering and Technology Management to provide a new perspective on PMU data accession and analysis. The team will use Portland State's High Performance Computing cluster for testing and benchmarking the PMU data architecture, programming interfaces, and algorithm performance.

This work supports **TIP 299**: "Synchrophasor Linear State Estimator and PMU Data Validation & Calibration" Coordinating with the BPA team in Vancouver WA we will support their data mining activities by providing a common user platform and parallel platform to build their data mining solution upon.

Why It Matters

The flood of information arriving with the advent of PMUs is causing challenges and opportunities. This project leverages open source and big data tools to enable greater researcher and practitioner productivity.

Goals and Objectives

The goals of this three-year project include: 1) Building a data architecture for securely organizing and accessing the PMU data using multiple platforms including MATLAB and R; 2) Providing an open-source interface to the data from popular data mining tools enabling researchers to focus on new algorithms, rather than data access details; 3) Removing the barrier of data access complexity, allowing more people to engage with synchrophasor data; 4) Testing performance of access and analysis of PMU data on a HPC cluster; 5) Benchmarking performance of existing and emerging algorithms for PMU data analysis; and 6) Characterize the historical data and events to make operational recommendations.

Deliverables

The project deliverables are supplied along three parallel paths:

Platform Development: Develop a prototype open software platform that enables the analysis and operational aspects of the project. The software will be developed with input from lead users at PSU and BPA.
Data Analysis: Provide analysis to extract information, gain understanding, test and evaluate algorithms.
Operational Support: Provide operational support at BPA, with the PSU team training BPA personnel how to manage the open source repository and do software builds.

Source code and documentation will be housed on a public open source repository (e.g. Git Hub). The software deployed to BPA will be deployed primarily from the external repository. All of the code, test (unit and release), build tools and documentation will be archived on the repository. BPA will be given the access credentials to the repository when it is setup.

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Project Start Date: October 1, 2014

Project End Date: September 30, 2017

Reports & References (Optional)

Links (Optional)

Funding

Total Project Cost:	$680,128
BPA Share:	$339,993
External Share:	$340,135
BPA FY2015 Budget:	$108,047

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